FORM PTO-1390 (REV. 5-93) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER: VO-665

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.5): 10/500,732

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP03/01290	10 February 2003	12 February 2002

TITLE OF INVENTION

METHOD FOR PRODUCING A COVER THAT CAN BE PLACED ON THE END OF A MOTOR VEHICLE EXHAUST PIPE, AND A COVER PRODUCED ACCORDING TO THIS METHOD

APPLICANT(S) FOR DO/EO/US

Manfred NEEF

#9

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☐ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ■ This is a **SECOND OR SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☐ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ■ A translation of the International Application into English (35 U.S.C. 371(c)(2)), including a translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). (verified) (copy as filed on 02 July 2004)
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). (verified)
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☐ A FIRST preliminary amendment.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification. (** attached to a red-ink marked-up version of the English language translation)
15. ☐ A change of power of attorney and/or address letter.
16. ■ Other items or information:
    - Certificate of Mailing by Express Mail (2 pages)
    - Response to Notification of Defective Response (3 pages)
    - Copy of Notification of Defective Response
    - Return Receipt Postcard

p203.2/ csh

EXPRESS MAIL NO.: EV478067876US
MAILED: 08 March 2005

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
10/500,732	PCT/EP03/01290	VO-665

17. ☐ The following fees are submitted:

BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)):

		CALCULATIONS PTO USE ONLY
Basic National Filing Fee	$ 300.00	
National Stage Search Fee	$ 500.00	
National Stage Examination Fee	$ 200.00	

ENTER APPROPRIATE BASIC FEE AMOUNT =		
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).		

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims			X $50.00		
Independent claims			X $200.00		
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ $360.00		
TOTAL OF ABOVE CALCULATIONS =					
☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.			+		
SUBTOTAL =					
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)).			+		
TOTAL NATIONAL FEE =					
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property			+		
TOTAL FEES ENCLOSED =					
				Amount to be: refunded	$
				charged	$

a. ☐ A check in the amount of $ _____ to cover the above fee is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of $_____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ■ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 19-3550. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SIGNATURE

Douglas H. Pauley

NAME

33,295

REGISTRATION NUMBER

SEND ALL CORRESPONDENCE TO:

Pauley Petersen & Erickson
2800 West Higgins Road, Suite 365
Hoffman Estates, Illinois 60195
(847) 490-1400
Fax: (847) 490-1403

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Manfred NEEF
Title:	METHOD FOR PRODUCING A COVER THAT CAN BE PLACED ON THE END OF A MOTOR VEHICLE EXHAUST PIPE, AND A COVER PRODUCED ACCORDING TO THIS METHOD
Serial No.:	10/500,732
Based Upon:	PCT/EP03/01290
Express Mail No.:	EV478067876US
Date of Deposit:	08 March 2005
Customer No.:	42419

CERTIFICATE OF MAILING BY EXPRESS MAIL

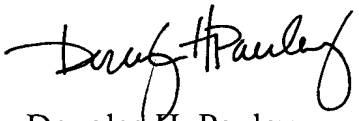
Mail Stop PCT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

I hereby certify that the following requisites of the subject Patent Application are being deposited with the United States Postal Service as Express Mail Post Office to Addressee No. EV478067876US, on 08 March 2005, and is addressed to Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, together with the items listed below.

- Transmittal Letter (Form PTO-1390) (2 pages), in duplicate
- Copy of previously filed Verified English language translation of the International Application, including a translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5))
- Response to Notification of Defective Response (3 pages)
- Copy of the Notification of Defective Response
- Return Receipt Postcard

Respectfully submitted,



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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Manfred NEEF
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RESPONSE TO NOTIFICATION OF DEFECTIVE RESPONSE

Mail Stop PCT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Applicant is responding to the Notification of Defective Response mailed on 08 February 2005. However, Applicant believes that the Notification of Defective Response was incorrectly issued, for the following reasons.

The Notification states that the number of claims in the International Application and the number of claims in the translation are not the same. Applicant has enclosed a copy of the entire English language translation, as filed on 02 July 2004. The verified English language translation contains two sets of claims: (1) originally filed Claims 1-7; and (2) replacement Claims 1-6.

Because the originally filed English language translation includes originally filed Claims 1-6, the number of claims in the International Application is the same as the number of original claims in the English language translation. Thus, the Notification of Defective Response was sent in error.

Request for Withdrawal of Notification of Defective Response

Because Applicant filed a verified English language translation that includes original Claims 1-7 as well as new Claims 1-6, Applicant requests withdrawal of the Notification of Defective Response.

Conditional Response

Applicant has enclosed a copy of the verified English language translation as originally filed on 02 July 2004. Although Applicant believes that no

fee is necessary for this Response, if it is determined that a fee is in fact due, the undersigned authorizes the Commissioner to charge any additional fee to Deposit Account 19-3550.

Respectfully submitted,

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METHOD FOR PRODUCING A COVER THAT CAN BE PLACED ON THE END OF A MOTOR VEHICLE EXHAUST PIPE, AND A COVER PRODUCED ACCORDING TO THIS METHOD

The invention relates to a method for producing a cover made of a special steel blank which can be deep-drawn and placed on the end of a motor vehicle exhaust pipe, and a cover produced in accordance with the invention.

Such covers are used as an ornamentation on the end of the exhaust pipe protruding from the rear of a motor vehicle. For this reason the non-rusting basic material, the special steel, and the appearance of the surface of the cover are of decisive importance.

As a rule, known covers of this type are bent from a special steel blank into a sleeve-shaped body and are welded together at the joint on the shell circumference. This requires a considerable outlay for labor, in particular in the course of the manufacture and finishing work for the weld seam. The result of this is that covers produced in this way are very expensive.

It is the object of the invention to provide a method of the type mentioned at the outset, by means of which such covers can be produced in one piece without welding work and without the finished cover experiencing impairments which make the cover less valuable or even turn it into waste.

In accordance with the invention, this object is attained by the combination of the following method steps which follow each other directly:

a) a circular blank (10) is made from a special steel plate,

b) a cup-shaped beaker (10.1, 10.2, 10.3, 10.4) with a bottom (11.4), which is inclined in respect to the longitudinal axis (25) and has a diameter (D1, D2, D3, D4) which is reduced in steps, and a shell length (L1, L2, L3, L4) which increases in steps, is drawn in several deep-drawing operations,

c) a centered hole (13) with a rim (14) which is ring- shaped toward the shell (12.4) is punched into the bottom (11.4),

d) the shell (12.4) is cut vertically in respect to the longitudinal axis (25) of the beaker (10.4) to the required length (Lo) and a condensate (16) and/or a fastening hole are cut into the shell (12.5),

e) the rim (14) of the bottom (11.4) is bent-in parallel in respect to the longitudinal axis (25) and is subsequently crimped into the beaker (10.6) to form an end (17) in the shape of an arc of a circle, and

f) at the finish the end section (18) on the cut open front (15) of the beaker (10.7) is tapered for decreasing the diameter.

In this connection it is crucial that these method steps are performed directly, i.e. in short periods of time, one after the other. Since the axial dimension of the cover is considerable for a deep-drawing method, the deep-drawing process must take place in several deep-drawing steps with diameters decreased in steps and a shell length increased in steps. These are followed by the method steps for forming the two open front faces of the cover,

wherein the crimped rim and the tapered end section of the cut-off shell result in the final shape of the cover by means of appropriate method steps.

In connection with one embodiment care must be taken in the method steps that the transition from the inclined bottom to the shell of the various deep-drawing steps is always rounded, so that no damage occurs, particularly in the transition area from the bottom to the shell of the drawn beaker.

Regarding the inclination of the bottom in respect to the longitudinal axis of the beaker it is provided that the bottom is inclined in respect to the shell of the various deep-drawing steps at a diameter by approximately 70°, or 110°, in respect to the longitudinal axis.

So that the front face of the cover facing the motor vehicle, and possible openings and/or holes in the shell of the beaker can be cut in a simple manner, an embodiment provides that the cutting-off of the shell to the required length and the cutting of the condensate drain opening and/or fastening hole are performed together. These method steps can be performed together, since they are performed in the same processing direction.

If it is provided that prior to crimping of the end in the form of an arc of a circle the bore in the bottom is shaved, the crimped end of the beveled front of the beaker becomes uniform.

A cover produced in accordance with the invention is distinguished in that it is embodied in one piece in a sleeve-like manner, wherein a front end, which is inclined in respect to the longitudinal axis, is provided with an end crimped in the shape of an arc of a circle, and wherein the other front end extending perpendicularly in respect to the longitudinal axis in the adjoining end section has a diameter which is less than the diameter

of the remaining shell. The crimped end provides stiffening and avoids sharp edges, while the tapered end section stabilizes the drawn cover and prevents undesired contractions of the material because of tensions occurring in the material.

The shell of the sleeve-shaped cover is provided with an opening and/or a bore, which can be used as a condensate drain or as a connection of the cover with the exhaust pipe.

The invention will be explained in greater detail by means of an exemplary embodiment represented in the drawings. Shown are in:

Fig. 1, a circular blank as the initial basis for producing a cover made of special steel,

Figs. 2 to 5, four deep-drawing processes for beakers as the pre-products with diameters reduced in steps and shell lengths increased in steps,

Fig. 6 and 7, cutting and punching the hole in the bottom of the beaker,

Fig. 8, cutting the shell of the beaker to size and cutting an opening and/or a bore into the shell of the beaker,

Fig. 9, shaving the hole in the bottom,

Fig. 10, a tool for the vertical alignment of the rim in the bottom,

Fig. 11, a tool for crimping the rim,

Fig. 12, tapering the end section of the shell,

Fig. 13, a vertical section through the finished cover,

Fig. 14, a plan view from the front end with the tapered end section on the sleeve-shaped cover, and

Fig. 15, the crimped end of the beveled front end of the finished cover in an enlarged partial view.

The circular blank 10 represented in a lateral view in Fig. 1 is produced, preferably cut, from a special steel plate which can be deep-drawn, of a diameter D1 of 190 mm, for example, and a thickness do of 1 to 1.2 mm, for example.

In a first deep-drawing process, a beaker 10.1 with an inclined bottom 11.1 is drawn by means of a deep-drawing process, whose diameter D1 = 117.7 mm, and the shell 12.1 is brought to a shell length L1. In this case the inclination of the bottom 11.1 in respect to the longitudinal axis 25 of the beaker 10.1 on a diameter is 70° or 110°, as shown in Fig. 2.

In the following second deep-drawing process, the beaker 10.2 is drawn with a smaller diameter D2 = 96.95 mm, but a greater length L2 of the shell 12.1, so that the beaker 10.1 in accordance with Fig. 1 has become the beaker 10.2, as shown in Fig. 3.

A further, third deep-drawing process follows, in which the beaker 10.2 in accordance with Fig. 3 is changed into a beaker 10.3 in accordance with Fig. 4, with a diameter D3 = 79.5 mm and a length L3 of the shell.

The deep-drawing process is ended in a fourth method step, in which finally the beaker 10.4 is created with the final diameter D4 = 68.7 mm and a length L4 of the shell 10.4 in accordance with Fig. 5. The lengths L1 to L4 result automatically, since the initial circular blank 10 is defined.

As Figs. 6 and 7 show, the slide is trimmed with a clipping punch 20 and a centered hole 13 is punched into the bottom 11.5 with the punch 30, so that an annular rim 14 remains around the hole 13.

Fig. 8 shows a cutting tool 40 and a punching tool 50, by means of which the length Lo of the shell 12.5 of the beaker 10,5 in accordance with Fig. 7 is shortened to the required length, wherein the resultant front face 15 is oriented perpendicularly in respect to the longitudinal axis 25 of the beaker 10.6. An opening 16 and/or a bore are punched into the shell 12.5, wherein cutting of the shell 12.6 and punching of the diameter 16 and/or the bore can occur simultaneously, since both work directions of the processes are the same.

As Fig. 9 shows, the bore 13.1 can be shaved in order to position the rim 14.1 uniformly around the shell 12.5 of the beaker 10.6.

Initially, an area of the rim 14.1 adjoining the hole 13.1 is crimped parallel with the longitudinal axis 25 of the beaker 10.6 by means of the two tools 50 and 55 and is thereafter shaped in the form of an arc of a circle by means of tool 60 and 65. In this case the tools 60 and 65 are matched in the form of a semicircle in the facing corner areas, as shown in Figs. 10 and 11.

As Fig. 12 shows, the finished front end 11.5 of the beaker is held by the tool 65, and a tool 70 tapers the end section 18 in the area of the cut-off front face 15 in such a way that the diameter of the cover 10.7 in this area is reduced. In the process, the cover 10.7 is supported in the receiver 19 of the tool 70. The crimped end 17 in the area of the front face 11.6 not only prevents sharp edges but, together with the tapered end section 18 of the shell 12.5, it is used for stabilizing the shaped cover 10.7, so that tensions caused by tensions

in the material cannot result in an uncontrolled contraction of the material and impairment of the surface of the cover 10.7.

It is possible in this way to produce in a cost-effective way and without worsening the shining surface a one-piece cover 10.7 from a special steel circular blank 10 in Fig. 1, which is made of a material which can be deep-drawn, as shown in Figs. 13 to 15.

Here, Fig. 13 shows a vertical section through the finished cover 10.7 with the crimped drain 17 on the inclined front face 11.6, with the hole 13.2 and the tapered end section 18 at the cut-off front end 15. The sectional view also shows the wall thickness of the cover 10.7, which is obtained by means of a material which is approximately 1 to 1.2 mm thick, but can compulsorily also have different thicknesses, caused by the various processing steps.

Fig. 14 shows the view into the hollow space formed by the cover 10.7, which is used as a receiver for the end of a motor vehicle exhaust pipe, from the direction of the front face 15.

Finally, a portion of the crimped circular end 17 is represented in an enlarged scale in Fig. 15.

Claims

1. A method for producing a cover made of a special steel blank which can be deep-drawn and placed on the end of a motor vehicle exhaust pipe, characterized by the combination of the method steps directly following each other:

a) a circular blank (10) is made from a special steel plate,

b) a cup-shaped beaker (10.1, 10.2, 10.3, 10.4) with a bottom (11.4), which is inclined in respect to the longitudinal axis (25) and has a diameter (D1, D2, D3, D4) which is reduced in steps and a shell length (L1, L2, L3, L4) which increases in steps is drawn in several deep-drawing operations,

c) a centered hole (13) with a rim (14) which is ring- shaped toward the shell (12.4) is punched into the bottom (11.4),

d) the shell (12.4) is cut vertically in respect to the longitudinal axis (25) of the beaker (10.4) to the required length (Lo) and a condensate (16) and/or a fastening hole are cut into the shell (12.5),

e) the rim (14) of the bottom (11.4) is bent-in parallel in respect to the longitudinal axis (25) and is subsequently crimped into the beaker (10.6) to form an end (17) in the shape of an arc of a circle, and

f) at the finish the end section (18) on the cut open front (15) of the beaker (10.7) is tapered for decreasing the diameter.

2. The method in accordance with claim 1,

characterized in that

the transition from the inclined bottom (11.1 to 11.6) to the shell (12.1 to 12.5) of the various deep-drawing steps is always rounded.

3. The method in accordance with claim 1 or 2,

characterized in that

the bottom (11.1 to 11.6) in respect to the shell (12. 1 to 12.5) of the various deep-drawing steps is inclined on a diameter of approximately 70° or 110° in relation to the longitudinal axis (25).

4. The method in accordance with one of claims 1 to 3,

characterized in that

cutting off the shell (12.4) to the required length (Lo) and cutting the condensate drain opening (16) and/or the fastening hole are performed together.

5. The method in accordance with one of claims 1 to 4,

characterized in that

the bore (13) in the bottom (11.5) is shaved (13.1) prior to crimping the end (15) in the shape of an arc of a circle.

6. A cover, produced in accordance with the method of claims 1 to 5, characterized in that

it is embodied to be of one piece and sleeve-shaped, wherein a front face (11.6), which is inclined in respect to the longitudinal axis (25), is provided with an end (17) which is crimped in the shape of an arc of a circle, and wherein the other front face (15) which extends perpendicularly in respect to the longitudinal axis (25) in the adjoining section (18) has a diameter which is smaller than the diameter (D4) of the remaining shell (12.4).

7. The cover in accordance with claim 6,

characterized in that

the shell (12.4) is provided with an opening (16) and/or a bore.

New Claims

1. A method for producing a cover made of a special steel blank which can be deep-drawn and placed on the end of a motor vehicle exhaust pipe, characterized by the combination of the method steps directly following each other:

a) a circular blank (10) is made from a special steel plate,

b) cup-shaped beakers (10.1, 10.2, 10.3, 10.4) with a bottom (11.4), which is inclined in respect to the longitudinal axis (25), wherein the diameters (D1, D2, D3, D4) are uniform over the entire shell length (L1, L2, L3, L4), but are more and more decreased, and the shell lengths (L1, L2, L3, L4), however, are more and more increased, are drawn in several deep-drawing operations,

c) a centered hole (13) with a rim (14) which is ring- shaped toward the shell (12.4) is punched into the bottom (11.4),

d) the shell (12.4) is cut vertically in respect to the longitudinal axis (25) of the beaker (10.4) to the required length (Lo) and a condensate drain opening (16) and a fastening hole are cut into the shell (12.5),

e) the rim (14) of the bottom (11.4) is bent-in parallel in respect to the longitudinal axis (25) and is subsequently crimped into the beaker (10.6) to form an end (17) in the shape of an arc of a circle, and

f) at the finish the end section (18) on the cut open front (15) of the beaker (10.7) is tapered for decreasing the diameter.

2. The method in accordance with claim 1,

characterized in that

the transition from the inclined bottom (11.1 to 11.6) to the shell (12.1 to 12.5) of the various deep-drawing steps is always rounded.

3. The method in accordance with claim 1 or 2,

characterized in that

the bottom (11.1 to 11.6) in respect to the shell (12. 1 to 12.5) of the various deep-drawing steps is inclined on a diameter of approximately 70° or 110° in relation to the longitudinal axis (25).

4. The method in accordance with one of claims 1 to 3,

characterized in that

cutting off the shell (12.4) to the required length (Lo) and cutting the condensate drain opening (16) and/or the fastening hole are performed together.

5. The method in accordance with one of claims 1 to 4,

characterized in that

the bore (13) in the bottom (11.5) is shaved (13.1) prior to crimping the end (15) in the shape of an arc of a circle.

6. A cover, produced in accordance with the method of claims 1 to 5,

characterized in that

crimped in the shape of an arc of a circle, and wherein the other front face (15) which extends perpendicularly in respect to the longitudinal axis (25) in the adjoining section (18) has a diameter which is smaller than the diameter (D4) of the remaining shell (12.4).

New Specification Section

(replaces page 2 to 7)

It is the object of the invention to provide a method of the type mentioned at the outset, by means of which such covers can be produced in one piece without welding work and without the finished cover experiencing impairments which make the cover less valuable or even turn it into waste.

In accordance with the invention, this object is attained by the combination of the following method steps which follow each other directly:

a) a circular blank (10) is made from a special steel plate,

b) cup-shaped beakers (10.1, 10.2, 10.3, 10.4) with a bottom (11.4), which is inclined in respect to the longitudinal axis (25), wherein the diameters (D1, D2, D3, D4) are uniform over the entire shell length (L1, L2, L3, L4), but are more and more decreased, and the shell lengths (L1, L2, L3, L4), however, are more and more increased, are drawn in several deep-drawing operations,

c) a centered hole (13) with a rim (14) which is ring- shaped toward the shell (12.4) is punched into the bottom (11.4),

d) the shell (12.4) is cut vertically in respect to the longitudinal axis (25) of the beaker (10.4) to the required length (Lo) and a condensate drain opening (16) and a fastening hole are cut into the shell (12.5),

e) the rim (14) of the bottom (11.4) is bent-in parallel in respect to the longitudinal axis (25) and is subsequently crimped into the beaker (10.6) to form an end (17) in the shape of an arc of a circle, and

f) at the finish the end section (18) on the cut open front (15) of the beaker (10.7) is tapered for decreasing the diameter.

In this connection it is crucial that these method steps are performed directly, i.e. in short periods of time, one after the other. Since the axial dimension of the cover is considerable for a deep-drawing method, the deep-drawing process must take place in several deep-drawing steps with diameters decreased in steps and a shell length increased in steps. These are followed by the method steps for forming the two open front faces of the cover, wherein the crimped rim and the tapered end section of the cut-off shell result in the final shape of the cover by means of appropriate method steps.

In connection with one embodiment care must be taken in the method steps that the transition from the inclined bottom to the shell of the various deep-drawing steps is always rounded, so that no damage occurs, particularly in the transition area from the bottom to the shell of the drawn beaker.

Regarding the inclination of the bottom in respect to the longitudinal axis of the beaker it is provided that the bottom is inclined in respect to the shell of the various deep-drawing steps at a diameter by approximately 70°, or 110°, in respect to the longitudinal axis.

So that the front face of the cover facing the motor vehicle, and possible openings and/or holes in the shell of the beaker can be cut in a simple manner, an embodiment provides that the cutting-off of the shell to the required length and the cutting of the condensate drain opening and/or fastening hole are performed together. These method steps can be performed together, since they are performed in the same processing direction.

If it is provided that prior to crimping of the end in the form of an arc of a circle the bore in the bottom is shaved, the crimped end of the beveled front of the beaker becomes uniform.

A cover produced in accordance with the invention is distinguished in that it is embodied in one piece in a sleeve-like manner, wherein a front end, which is inclined in respect to the longitudinal axis, is provided with an end crimped in the shape of an arc of a circle, and wherein the other front end extending perpendicularly in respect to the longitudinal axis in the adjoining end section has a diameter which is less than the diameter of the remaining shell. The crimped end provides stiffening and avoids sharp edges, while the tapered end section stabilizes the drawn cover and prevents undesired contractions of the material because of tensions occurring in the material.

The shell of the sleeve-shaped cover is provided with a condensate drain and a fastening hole.

The invention will be explained in greater detail by means of an exemplary embodiment represented in the drawings. Shown are in:

Fig. 1, a circular blank as the initial basis for producing a cover made of special steel,

Figs. 2 to 5, four deep-drawing processes for beakers as the pre-products with increasingly reduced diameters and increasingly increased shell lengths,

Fig. 6 and 7, cutting and punching the hole in the bottom of the beaker,

Fig. 8, cutting the shell of the beaker to size and cutting an opening and/or a bore into the shell of the beaker,

Fig. 9, shaving the hole in the bottom,

Fig. 10, a tool for the vertical alignment of the rim in the bottom,

Fig. 11, a tool for crimping the rim,

Fig. 12, tapering the end section of the shell,

Fig. 13, a vertical section through the finished cover,

Fig. 14, a plan view from the front end with the tapered end section on the sleeve-shaped cover, and

Fig. 15, the crimped end of the beveled front end of the finished cover in an enlarged partial view.

The circular blank 10 represented in a lateral view in Fig. 1 is produced, preferably cut, from a special steel plate which can be deep-drawn, of a diameter D1 of 190 mm, for example, and a thickness do of 1 to 1.2 mm, for example.

In a first deep-drawing process, a beaker 10.1 with an inclined bottom 11.1 is drawn by means of a deep-drawing process, whose diameter D1 = 117.7 mm, and the shell 12.1 is brought to a shell length L1. In this case the inclination of the bottom 11.1 in respect to the longitudinal axis 25 of the beaker 10.1 on a diameter is 70° or 110°, as shown in Fig. 2.

In the following second deep-drawing process, the beaker 10.2 is drawn with a smaller diameter D2 = 96.95 mm, but a greater length L2 of the shell 12.1, so that the beaker 10.1 in accordance with Fig. 1 has become the beaker 10.2, as shown in Fig. 3.

A further, third deep-drawing process follows, in which the beaker 10.2 in accordance with Fig. 3 is changed into a beaker 10.3 in accordance with Fig. 4, with a diameter D3 = 79.5 mm and a length L3 of the shell.

The deep-drawing process is ended in a fourth method step, in which finally the beaker 10.4 is created with the final diameter D4 = 68.7 mm and a length L4 of the shell 10.4 in accordance with Fig. 5. The lengths L1 to L4 result automatically, since the initial circular blank 10 is defined.

As Figs. 6 and 7 show, the slide is trimmed with a clipping punch 20 and a centered hole 13 is punched into the bottom 11.5 with the punch 30, so that an annular rim 14 remains around the hole 13.

Fig. 8 shows a cutting tool 40 and a punching tool 50, by means of which the length Lo of the shell 12.5 of the beaker 10,5 in accordance with Fig. 7 is shortened to the required length, wherein the resultant front face 15 is oriented perpendicularly in respect to the longitudinal axis 25 of the beaker 10.6. An condensate drain 16 and a fastening hole are punched into the shell 12.5, wherein cutting of the shell 12.6 and punching of the condensate drain 16 and the fastening hole can occur simultaneously, since both work directions of the processes are the same.

As Fig. 9 shows, the bore 13.1 can be shaved in order to position the rim 14.1 uniformly around the shell 12.5 of the beaker 10.6.

Initially, an area of the rim 14.1 adjoining the hole 13.1 is crimped parallel with the longitudinal axis 25 of the beaker 10.6 by means of the two tools 50 and 55 and is thereafter shaped in the form of an arc of a circle by means of tool 60 and 65. In this case the tools 60 and 65 are matched in the form of a semicircle in the facing corner areas, as shown in Figs. 10 and 11.

As Fig. 12 shows, the finished front end 11.5 of the beaker is held by the tool 65, and a tool 70 tapers the end section 18 in the area of the cut-off front face 15 in such a way that the diameter of the cover 10.7 in this area is reduced. In the process, the cover 10.7 is supported in the receiver 19 of the tool 70. The crimped end 17 in the area of the front face 11.6 not only prevents sharp edges but, together with the tapered end section 18 of the shell 12.5, it is used for stabilizing the shaped cover 10.7, so that tensions caused by tensions in the material cannot result in an uncontrolled contraction of the material and impairment of the surface of the cover 10.7.

It is possible in this way to produce in a cost-effective way and without worsening the shining surface a one-piece cover 10.7 from a special steel circular blank 10 in Fig. 1, which is made of a material which can be deep-drawn, as shown in Figs. 13 to 15.

New Claims

1. A method for producing a cover made of a special steel blank which can be deep-drawn and placed on the end of a motor vehicle exhaust pipe, characterized by the combination of the method steps directly following each other:

a) a circular blank (10) is made from a special steel plate,

b) cup-shaped beakers (10.1, 10.2, 10.3, 10.4) with a bottom (11.4), which is inclined in respect to the longitudinal axis (25), wherein the diameters (D1, D2, D3, D4) are uniform over the entire shell length (L1, L2, L3, L4), but are more and more decreased, and the shell lengths (L1, L2, L3, L4), however, are more and more increased, are drawn in several deep-drawing operations,

c) a centered hole (13) with a rim (14) which is ring- shaped toward the shell (12.4) is punched into the bottom (11.4),

d) the shell (12.4) is cut vertically in respect to the longitudinal axis (25) of the beaker (10.4) to the required length (Lo) and a condensate drain opening (16) and a fastening hole are cut into the shell (12.5),

e) the rim (14) of the bottom (11.4) is bent-in parallel in respect to the longitudinal axis (25) and is subsequently crimped into the beaker (10.6) to form an end (17) in the shape of an arc of a circle, and

f) at the finish the end section (18) on the cut open front (15) of the beaker (10.7) is tapered for decreasing the diameter.

2. The method in accordance with claim 1,

characterized in that

the transition from the inclined bottom (11.1 to 11.6) to the shell (12.1 to 12.5) of the various deep-drawing steps is always rounded.

3. The method in accordance with claim 1 or 2,

characterized in that

the bottom (11.1 to 11.6) in respect to the shell (12. 1 to 12.5) of the various deep-drawing steps is inclined on a diameter of approximately 70° or 110° in relation to the longitudinal axis (25).

4. The method in accordance with one of claims 1 to 3,

characterized in that

cutting off the shell (12.4) to the required length (Lo) and cutting the condensate drain opening (16) and/or the fastening hole are performed together.

5. The method in accordance with one of claims 1 to 4,

characterized in that

the bore (13) in the bottom (11.5) is shaved (13.1) prior to crimping the end (15) in the shape of an arc of a circle.

6. A cover, produced in accordance with the method of claims 1 to 5,

characterized in that

crimped in the shape of an arc of a circle, and wherein the other front face (15) which extends perpendicularly in respect to the longitudinal axis (25) in the adjoining section (18) has a diameter which is smaller than the diameter (D4) of the remaining shell (12.4).

New Specification Section

(replaces page 2 to 7)

It is the object of the invention to provide a method of the type mentioned at the outset, by means of which such covers can be produced in one piece without welding work and without the finished cover experiencing impairments which make the cover less valuable or even turn it into waste.

In accordance with the invention, this object is attained by the combination of the following method steps which follow each other directly:

a) a circular blank (10) is made from a special steel plate,

b) cup-shaped beakers (10.1, 10.2, 10.3, 10.4) with a bottom (11.4), which is inclined in respect to the longitudinal axis (25), wherein the diameters (D1, D2, D3, D4) are uniform over the entire shell length (L1, L2, L3, L4), but are more and more decreased, and the shell lengths (L1, L2, L3, L4), however, are more and more increased, are drawn in several deep-drawing operations,

c) a centered hole (13) with a rim (14) which is ring- shaped toward the shell (12.4) is punched into the bottom (11.4),

d) the shell (12.4) is cut vertically in respect to the longitudinal axis (25) of the beaker (10.4) to the required length (Lo) and a condensate drain opening (16) and a fastening hole are cut into the shell (12.5),

e) the rim (14) of the bottom (11.4) is bent-in parallel in respect to the longitudinal axis (25) and is subsequently crimped into the beaker (10.6) to form an end (17) in the shape of an arc of a circle, and

f) at the finish the end section (18) on the cut open front (15) of the beaker (10.7) is tapered for decreasing the diameter.

In this connection it is crucial that these method steps are performed directly, i.e. in short periods of time, one after the other. Since the axial dimension of the cover is considerable for a deep-drawing method, the deep-drawing process must take place in several deep-drawing steps with diameters decreased in steps and a shell length increased in steps. These are followed by the method steps for forming the two open front faces of the cover, wherein the crimped rim and the tapered end section of the cut-off shell result in the final shape of the cover by means of appropriate method steps.

In connection with one embodiment care must be taken in the method steps that the transition from the inclined bottom to the shell of the various deep-drawing steps is always rounded, so that no damage occurs, particularly in the transition area from the bottom to the shell of the drawn beaker.

Regarding the inclination of the bottom in respect to the longitudinal axis of the beaker it is provided that the bottom is inclined in respect to the shell of the various deep-drawing steps at a diameter by approximately 70°, or 110°, in respect to the longitudinal axis.

So that the front face of the cover facing the motor vehicle, and possible openings and/or holes in the shell of the beaker can be cut in a simple manner, an embodiment provides that the cutting-off of the shell to the required length and the cutting of the condensate drain opening and/or fastening hole are performed together. These method steps can be performed together, since they are performed in the same processing direction.

If it is provided that prior to crimping of the end in the form of an arc of a circle the bore in the bottom is shaved, the crimped end of the beveled front of the beaker becomes uniform.

A cover produced in accordance with the invention is distinguished in that it is embodied in one piece in a sleeve-like manner, wherein a front end, which is inclined in respect to the longitudinal axis, is provided with an end crimped in the shape of an arc of a circle, and wherein the other front end extending perpendicularly in respect to the longitudinal axis in the adjoining end section has a diameter which is less than the diameter of the remaining shell. The crimped end provides stiffening and avoids sharp edges, while the tapered end section stabilizes the drawn cover and prevents undesired contractions of the material because of tensions occurring in the material.

The shell of the sleeve-shaped cover is provided with a condensate drain and a fastening hole.

The invention will be explained in greater detail by means of an exemplary embodiment represented in the drawings. Shown are in:

Fig. 1, a circular blank as the initial basis for producing a cover made of special steel,

Figs. 2 to 5, four deep-drawing processes for beakers as the pre-products with increasingly reduced diameters and increasingly increased shell lengths,

Fig. 6 and 7, cutting and punching the hole in the bottom of the beaker,

Fig. 8, cutting the shell of the beaker to size and cutting an opening and/or a bore into the shell of the beaker,

Fig. 9, shaving the hole in the bottom,

Fig. 10, a tool for the vertical alignment of the rim in the bottom,

Fig. 11, a tool for crimping the rim,

Fig. 12, tapering the end section of the shell,

Fig. 13, a vertical section through the finished cover,

Fig. 14, a plan view from the front end with the tapered end section on the sleeve-shaped cover, and

Fig. 15, the crimped end of the beveled front end of the finished cover in an enlarged partial view.

The circular blank 10 represented in a lateral view in Fig. 1 is produced, preferably cut, from a special steel plate which can be deep-drawn, of a diameter D1 of 190 mm, for example, and a thickness do of 1 to 1.2 mm, for example.

In a first deep-drawing process, a beaker 10.1 with an inclined bottom 11.1 is drawn by means of a deep-drawing process, whose diameter D1 = 117.7 mm, and the shell 12.1 is brought to a shell length L1. In this case the inclination of the bottom 11.1 in respect to the longitudinal axis 25 of the beaker 10.1 on a diameter is 70° or 110°, as shown in Fig. 2.

In the following second deep-drawing process, the beaker 10.2 is drawn with a smaller diameter D2 = 96.95 mm, but a greater length L2 of the shell 12.1, so that the beaker 10.1 in accordance with Fig. 1 has become the beaker 10.2, as shown in Fig. 3.

A further, third deep-drawing process follows, in which the beaker 10.2 in accordance with Fig. 3 is changed into a beaker 10.3 in accordance with Fig. 4, with a diameter D3 = 79.5 mm and a length L3 of the shell.

The deep-drawing process is ended in a fourth method step, in which finally the beaker 10.4 is created with the final diameter D4 = 68.7 mm and a length L4 of the shell 10.4 in accordance with Fig. 5. The lengths L1 to L4 result automatically, since the initial circular blank 10 is defined.

As Figs. 6 and 7 show, the slide is trimmed with a clipping punch 20 and a centered hole 13 is punched into the bottom 11.5 with the punch 30, so that an annular rim 14 remains around the hole 13.

Fig. 8 shows a cutting tool 40 and a punching tool 50, by means of which the length Lo of the shell 12.5 of the beaker 10,5 in accordance with Fig. 7 is shortened to the required length, wherein the resultant front face 15 is oriented perpendicularly in respect to the longitudinal axis 25 of the beaker 10.6. An condensate drain 16 and a fastening hole are punched into the shell 12.5, wherein cutting of the shell 12.6 and punching of the condensate drain 16 and the fastening hole can occur simultaneously, since both work directions of the processes are the same.

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Initially, an area of the rim 14.1 adjoining the hole 13.1 is crimped parallel with the longitudinal axis 25 of the beaker 10.6 by means of the two tools 50 and 55 and is thereafter shaped in the form of an arc of a circle by means of tool 60 and 65. In this case the tools 60 and 65 are matched in the form of a semicircle in the facing corner areas, as shown in Figs. 10 and 11.

As Fig. 12 shows, the finished front end 11.5 of the beaker is held by the tool 65, and a tool 70 tapers the end section 18 in the area of the cut-off front face 15 in such a way that the diameter of the cover 10.7 in this area is reduced. In the process, the cover 10.7 is supported in the receiver 19 of the tool 70. The crimped end 17 in the area of the front face 11.6 not only prevents sharp edges but, together with the tapered end section 18 of the shell 12.5, it is used for stabilizing the shaped cover 10.7, so that tensions caused by tensions in the material cannot result in an uncontrolled contraction of the material and impairment of the surface of the cover 10.7.

It is possible in this way to produce in a cost-effective way and without worsening the shining surface a one-piece cover 10.7 from a special steel circular blank 10 in Fig. 1, which is made of a material which can be deep-drawn, as shown in Figs. 13 to 15.

JAN MCLIN CLAYBERG
PATENT AND TECHNICAL TRANSLATION

COPY

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January 22, 2004

DECLARATION

The undersigned, Olaf Bexhoeft, hereby states that he is well acquainted with both the English and German languages and that the attached is a true translation to the best of his knowledge and ability of the German text of PCT/EP03/01290, filed 02/10/2003 and published 08/21/2003 under No. WO 03/069140 A1, and of six (6) pages of amended specification and six (6) amended claims.

The undersigned further declares that the above statement is true; and further, that this statement was made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or document or any patent resulting therefrom.

Olaf Bexhoeft

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MAILED 02 JUL 2004

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U.S. APPLICATION NUMBER NO.	FIRST NAMED APPLICANT	ATTY. DOCKET NO.
10/500,732	Manfred Neef	VO-665

INTERNATIONAL APPLICATION NO.	
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I.A. FILING DATE	PRIORITY DATE
02/10/2003	02/12/2002

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CONFIRMATION NO. 7185

371 FORMALITIES LETTER

OC000000015124364

Date Mailed: 02/08/2005

NOTIFICATION OF DEFECTIVE RESPONSE

The following items have been submitted by the applicant or the IB to the United States Patent and Trademark Office as a Designated / Elected Office (37 CFR 1.495)

- Indication of Small Entity Status
- Priority Document
- Copy of the International Application filed on 07/02/2004
- English Translation of the IA filed on 01/14/2005
- Copy of the International Search Report filed on 07/02/2004
- Copy of IPE Report filed on 07/02/2004
- Preliminary Amendments filed on 07/02/2004
- Information Disclosure Statements filed on 07/02/2004
- Oath or Declaration filed on 01/14/2005
- Small Entity Statement filed on 07/02/2004
- Request for Immediate Examination filed on 07/02/2004
- U.S. Basic National Fees filed on 07/02/2004
- Assignment filed on 01/14/2005
- Priority Documents filed on 07/02/2004

Applicant's response filed 01/14/2005 is hereby acknowledged. The following requirements set forth in the NOTIFICATION of MISSING REQUIREMENTS mailed 11/16/2004 have not been completed.

The following items **MUST** be furnished within the period set forth below in order to complete the requirements for acceptance under 35 U.S.C. 371:

- Translation of the application into English. The current translation of the application into English is defective as described below. Note a processing fee will be required if submitted later than 30 months from the priority date.
  - The number of claims in the International Application and the number of claims in the translation are not the same.

- Processing fee for providing the translation of the application and/or the Annexes later than 30 months

from the priority date (37 CFR 1.492(f)).

SUMMARY OF FEES DUE:

Total additional fees required for this application is **$130** for a Small Entity:

Applicant is required to complete the response within a time limit of ONE MONTH from the date of this Notification or within the time remaining in the response set forth in the Notification of Missing Requirements, whichever is the longer. No extension of this time limit may be granted under 37 CFR 1.136, but the period for response set in the Notification of Missing Requirements may be extended under 37 CFR 1.136(a).

- **$130** for English translation surcharge not received in full.

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

*A copy of this notice **MUST** be returned with the response.*

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PART 2 - OFFICE COPY

U.S. APPLICATION NUMBER NO.	INTERNATIONAL APPLICATION NO.	ATTY. DOCKET NO.
10/500,732	PCT/EP03/01290	VO-665

FORM PCT/DO/EO/916 (371 Formalities Notice)

Verfahren zum Herstellen einer auf das Ende eines Kraftfahrzeug-Auspuffrohres aufsetzbaren Blende und eine nach dem Verfahren hergestellte Blende

Die Erfindung betrifft ein Verfahren zum Herstellen einer auf das Ende eines Kraftfahrzeug-Auspuffrohres aufsetzbaren Blende aus tiefziehfähigem Edelstahl-Zuschnitt und eine nach dem Verfahren hergestellte Blende.

Derartige Blenden dienen als Zierstück auf dem an der Rückseite eines Kraftfahrzeuges vorstehenden Ende des Auspuffrohres. Aus diesem Grunde kommt es entscheidend auf das nichtrostende Ausgangsmaterial Edelstahl und auf das Aussehen der Oberfläche der Blende an.

Bekannte Blenden dieser Art werden in der Regel aus einem Edelstahl-Zuschnitt zu dem hülsenförmigen Körper gebogen und an der Stoß-Stelle auf dem Mantelumfang zusammengeschweißt. Dies bedingt einen erheblichen Arbeitsaufwand, insbesondere bei der Herstellung und Nacharbeit für die Schweißnaht. Die Folge davon ist, dass derartig hergestellte Blenden sehr teuer sind.

Es ist Aufgabe der Erfindung, ein Verfahren der eingangs erwähnten Art zu schaffen, mit dem derartige Blenden ohne Schweißarbeiten einstückig hergestellt werden können, ohne dass die fertig hergestellte Blende Beeinträchtigungen erfährt, die die Blende als minderwertig oder gar als Ausschuss werden lässt.

Diese Aufgabe wird nach der Erfindung durch die Kombination folgender unmittelbar aufeinanderfolgender Verfahrensschritte gelöst:

a) aus Edelstahlblech wird eine Ronde (10) hergestellt,

b) in mehreren Tiefziehvorgängen wird ein topfartiger Becher (10.1; 10.2; 10.3; 10.4) mit gegenüber der Längsachse (25) geneigtem Boden (11.4) mit stufig abnehmendem Durchmesser (D1, D2, D3, D4) und stufig zunehmender Mantellänge (L1, L2, L3, L4) gezogen,

c) in den Boden (11.4) wird ein zentrisches Loch (13) mit zum Mantel (12.4) hin ringförmigem Rand (14) eingestanzt,

d) der Mantel (12.4) wird senkrecht zur Längsachse (25) des Bechers (10.4) auf die geforderte Länge (Lo) abgeschnitten und in den Mantel (12.5) wird ein Kondensat (16) und/oder ein Befestigungsloch eingebracht,

e) der Rand (14) des Bodens (11.5) wird parallel zur Längsachse (25) eingebogen und anschließend zu einem kreisbogenförmigen Abschluss (17) in den Becher (10.6) eingerollt und

f) zum Schluss wird der Endabschnitt (18) auf der geschnittenen offenen Stirnseite (15) des Bechers (10.7) zur Verringerung des Durchmessers eingezogen.

Entscheidend ist dabei in erster Linie, dass diese Verfahrensschritte unmittelbar, d.h. in kurzen Zeitabständen, aufeinanderfolgend durchgeführt werden. Da die axiale Abmessung der Blende doch beachtlich für das Tiefziehverfahren ist, muss der Tiefziehvorgang in mehreren Tiefziehschritten mit stufig abnehmendem Durchmesser und stufig zunehmender Mantellänge erfolgen. Dann schließen sich die Verfahrensschritte zur Ausbildung der beiden offenen Stirnseiten der Blende an, wobei der eingerollte Rand und der eingezogene Endabschnitt des abgeschnittenen Mantels mit entsprechenden Verfahrensschritten zur endgültigen Form der Blende führen.

Nach einer Ausgestaltung ist bei den Verfahrensschritten darauf zu achten, dass der Übergang vom geneigten Boden zu dem Mantel der verschiedenen Tiefziehschritte stets abgerundet wird, damit gerade im Übergangsbereich vom Boden zum Mantel des gezogenen Bechers keine Beschädigungen auftreten.

Für die Neigung des Bodens gegenüber der Längsachse des Bechers wird vorgesehen, dass der Boden zu dem Mantel der verschiedenen Tiefziehschritte auf einem Durchmesser etwa mit 70° bzw. 110° zur Längsachse geneigt wird.

Damit die dem Kraftfahrzeug zugekehrte Stirnseite der Blende und eventuelle Durchbrüche und/oder Löcher in dem Mantel des Bechers auf einfache Weise eingebracht werden können, sieht eine Ausgestaltung vor, dass das Abschneiden des Mantels auf die geforderte Länge und das Einbringen des Kondensat-Ablaufdurchbruches und/oder Befestigungsloches zusammen durchgeführt werden. Diese Verfahrensschritte können gemeinsam vorgenommen werden, da sie in der gleichen Bearbeitungsrichtung erfolgen.

Ist vorgesehen, dass vor dem Einrollen des kreisbogenförmigen Abschlusses die Bohrung im Boden nachgeschnitten wird, dann wird der eingerollte Abschluss der abgeschrägten Stirnseite des Bechers gleichmäßig.

Eine nach dem Verfahren hergestellte Blende ist dadurch gekennzeichnet, dass sie einstückig hülsenförmig ausgebildet ist, wobei eine zur Längsachse geneigte Stirnseite mit einem kreisbogenförmig eingerollten Abschluss versehen ist und wobei die andere senkrecht zur Längsachse stehende Stirnseite im anschließenden Endabschnitt einen Durchmesser aufweist, der kleiner ist als der Durchmesser des übrigen Mantels. Der eingerollte Abschluss bringt eine Versteifung und vermeidet scharfe Kanten, während der eingezogene Endabschnitt die gezogene Blende stabilisiert und unerwünschte Materialrückstellungen aufgrund von im Material auftretenden Spannungen verhindert.

Der Mantel der hülsenförmigen Blende ist mit einem Durchbruch und/oder Bohrung versehen, die als Kondensat-Ablauf oder zur Verbindung der Blende mit dem Auspuffrohr verwendet werden können.

Die Erfindung wird anhand eines in den Zeichnungen dargestellten Ausführungsbeispiels näher erläutert. Es zeigen:

Fig. 1 eine Ronde als Ausgangsbasis für die Herstellung einer Edelstahl-Blende,

Fig. 2 bis 5 vier Tiefziehvorgänge für Becher als Vorprodukte mit stufig reduzierten Durchmessern und stufig zunehmenden Mantellängen,

Fig. 6 und 7	Beschneiden und Stanzen des Loches im Boden des Bechers,
Fig. 8	Ablängen des Mantels des Bechers und Einbringen eines Durchbruches und/oder einer Bohrung in den Mantel des Bechers,
Fig. 9	Nachschneiden des Loches im Boden,
Fig. 10	Werkzeug zum vertikalen Ausrichten des Randes im Boden,
Fig. 11	Werkzeug zum Einrollen des Randes,
Fig. 12	Einziehen des Mantel-Endabschnittes,
Fig. 13	im Vertikalschnitt die fertiggestellte Blende,
Fig. 14	die Ansicht von der Stirnseite mit dem eingezogenen Endabschnitt in die hülsenförmige Blende und
Fig. 15	in vergrößerter Teilansicht den eingerollten Abschluss der abgeschrägten Sitrnseite der fertiggestellten Blende.

Die in Fig. 1 in Seitenansicht gezeigte Ronde 10 wird aus tiefziehfähigem Edelstahlblech mit einem Durchmesser D1 von z. B. 190 mm und einer Stärke do von z.B. 1 bis 1,2 mm hergestellt, vorzugsweise geschnitten.

In einem ersten Tiefziehvorgang wird aus der Ronde 10 ein Becher 10.1 mit geneigtem Boden 11.1 gezogen, der im Durchmesser auf D1 = 117,7 mm und in der Mantellänge L1 des Mantels 12.1 gebracht wird. Dabei ist die Neigung des bodens 11.1 zur Längsachse 25 des Bechers 10.1 auf einem Durchmesser 70° bzw. 110°, wie Fig. 2 zeigt.

Im anschließenden zweiten Tiefziehvorgang wird der Becher 10.2 mit einem kleineren Durchmesser D2 = 96, 95 mm, jedoch größerer Länge L2 des Mantels 12.2 gezogen, so dass der Becher 10.1 nach Fig. 1 zum Becher 10.2 geworden ist, wie Fig. 3 zeigt.

Es folgt ein weiterer, dritter Tiefziehvorgang, in dem der Becher 10.2 nach Fig. 3 zu einem Becher 10.3 nach Fig. 4 mit einem Durchmesser D3 = 79,5 mm und einer Länge L3 des Mantels 12.3 verändert wird.

Der Tiefziehprozess wird in einem vierten Verfahrensschritt beendet, in dem schließlich ein Becher 10.4 mit dem Enddurchmesser D4 = 66,7 mm und einer Länge L4 des Mantels 12.4 nach Fig. 5 entsteht. Die Längen L1 bis L4 ergeben sich automatisch, da die Ausgangsronde 10 definiert ist.

Wie die Fig. 6 und 7 zeigen, wird mit einem Schneidstempel 20 der Schieber beschnitten und mit dem Stanzstempel 30 in den Boden 11.5 ein zentrisches Loch 13 eingestanzt, so dass um das Loch 13 ein ringförmiger Rand 14 stehen bleibt.

Die Fig. 8 zeigt ein Schneidwerkzeug 40 und ein Stanzwerkzeug 50, mit denen der Mantel 12.5 des Bechers 10.5 nach Fig.7 in der Länge Lo auf das geforderte Maß

gekürzt wird, wobei die erhaltene Stirnseite 15 senkrecht zu der Längsachse 25 des Bechers 10.6 gerichtet ist. In den Mantel 12.5 wird ein Durchbruch 16 und/oder eine Bohrung eingestanzt, wobei das Abschneiden des Mantels 12.6 und das Stanzen des Durchmessers 16 und/oder der Bohrung gleichzeitig erfolgen kann, da beide Arbeitsrichtungen der Vorgänge gleich verlaufen.

Wie Fig. 9 zeigt, kann die Bohrung 13.1 nachgeschnitten werden, um den Rand 14.1 gleichförmig um den Mantel 12.5 des Bechers 10.6 zu positionieren.

Mit den beiden Werkzeugen 50 und 55 wird zunächst ein dem Loch 13.1 benachbarter Bereich des Randes 14.1 parallel zur Längsachse 25 des Bechers 10.6 eingebogen und dann anschließend mit Werkzeugen 60 und 65 kreisbogenförmig geformt. Dabei sind die Werkzeuge 60 und 65 in den zugekehrten Eckbereichen halbkreisförmig aufeinander angepasst, wie die Fig. 10 und 11 zeigen.

Wie Fig. 12 zeigt, wird die fertige Stirnseite 11.5 des Bechers mit dem Werkzeug 65 gehalten und ein Werkzeug 70 zieht den Endabschnitt 18 im Bereich der abgeschnittenen Stirnseite 15 so ein, dass der Durchmesser der Blende 10.7 in diesem Bereich verkleinert ist. Dabei stützt sich die Blende 10.7 in der Aufnahme 19 des Werkzeuges 70 ab. Der eingerollte Abschluss 17 im Bereich der Stirnseite 11.6 vermeidet nicht nur scharfe Kanten, sondern dient in Verbindung mit dem eingezogenen Endabschnitt 18 des Mantels 12.5 der Stabilisierung der verformten Blende 10.7, so dass die durch Spannungen im Material entstehenden Spannungen zu keiner unkontrollierbaren Materialrückstellung mit Beeinträchtigung der Oberfläche der Blende 10.7 führen.

Auf diese Weise kann aus einer Edelstahl-Ronde 10 der Fig. 1 aus tiefziehfähigem Material eine einstückige Blende 10.7 in kostengünstiger Weise ohne Verschlechterung der glänzenden Oberfläche hergestellt werden, wie sie in den Fig. 13 bis 15 gezeigt ist.

Dabei zeigt die Fig. 13 einen Vertikalschnitt durch die fertige Blende 10.7 mit dem eingerollten Abfluss 17 an der geneigten Stirnseite 11.6 mit dem Loch 13.2 und dem eingezogenen Endabschnitt 18 an der abgeschnittenen Stirnseite 15. Der Schnitt lässt auch die Wandstärke der Blende 10.7 erkennen, die mit einem etwa 1 bis 1,2 mm starken Material erhalten wird und zwangsweise auch unterschiedlich stark sein kann, was durch die verschiedenen Bearbeitungsvorgänge bedingt ist.

Fig. 14 zeigt die Ansicht in den von der Blende 10.7 gebildeten Hohlraum von der Stirnseite 15 aus gesehen, der als Aufnahme des Endes eines Kraftfahrzeug-Auspuffrohres dient.

Schließlich ist in Fig. 15 ein Teil des eingerollten kreisförmigen Abschlusses 17 in vergrößertem Maßstab dargestellt.

Ansprüche

1. Verfahren zum Herstellen einer auf das Ende eines Kraftfahrzeug-Auspuffrohres aufsetzbaren Blende aus tiefziehfähigem Edelstahl-Zuschnitt, gekennzeichnet durch die Kombination der unmittelbar aufeinanderfolgenden Verfahrensschritte:

   a) aus Edelstahlblech wird eine Ronde (10) hergestellt,

   b) in mehreren Tiefziehvorgängen wird ein topfartiger Becher (10.1; 10.2; 10.3; 10.4) mit gegenüber der Längsachse (25) geneigtem Boden (11.4) mit stufig abnehmendem Durchmesser (D1, D2, D3, D4) und stufig zunehmender Mantellänge (L1, L2, L3, L4) gezogen,

   c) in den Boden (11.4) wird ein zentrisches Loch (13) mit zum Mantel (12.4) hin ringförmigem Rand (14) eingestanzt,

   d) der Mantel (12.4) wird senkrecht zur Längsachse (25) des Bechers (10.4) auf die geforderte Länge (Lo) abgeschnitten und in den Mantel (12.5) wird ein Kondensat (16) und/oder ein Befestigungsloch eingebracht,

e) der Rand (14) des Bodens (11.5) wird parallel zur Längsachse (25) eingebogen und anschließend zu einem kreisbogenförmigen Abschluss (17) in den Becher (10.6) eingerollt und

f) zum Schluss wird der Endabschnitt (18) auf der geschnittenen offenen Stirnseite (15) des Bechers (10.7) zur Verringerung des Durchmessers eingezogen.

2. Verfahren nach Anspruch 1,
dadurch gekennzeichnet,
dass der Übergang vom geneigten Boden (11.1 bis 11.6) zu dem Mantel (12.1 bis 12.5) der verschiedenen Tiefziehschritte stets abgerundet wird.

3. Verfahren nach Anspruch 1 oder 2,
dadurch gekennzeichnet,
dass der Boden (11.1 bis 11.6) zu dem Mantel (12.1 bis 12.5) der verschiedenen Tiefziehschritte auf einem Durchmesser etwa mit 70° bzw. 110° zur Längsachse (25) geneigt wird.

4. Verfahren nach einem der Ansprüche 1 bis 3,
dadurch gekennzeichnet,
dass das Abschneiden des Mantels (12.4) auf die geforderte Länge (Lo) und das Einbringen des Kondensat-Ablaufdurchbruches (16) und/oder Befestigungsloches zusammen durchgeführt werden.

5. Verfahren nach einem der Ansprüche 1 bis 4,
dadurch gekennzeichnet,
dass vor dem Einrollen des kreisbogenförmigen Abschlusses (15) die Bohrung (13) im Boden (11.5) nachgeschnitten wird (13.1).

6. Blende, hergestellt nach dem Verfahren der Ansprüche 1 bis 5, dadurch gekennzeichnet, dass sie einstückig hülsenförmig ausgebildet ist, wobei eine zur Längsachse (25) geneigte Stirnseite (11.6) mit einem kreisbogenförmig eingerollten Abschluss (17) versehen ist und wobei die andere senkrecht zur Längsachse (25) stehende Stirnseite (15) im anschließenden Endabschnitt (18) einen Durchmesser aufweist, der kleiner ist als der Durchmesser (D4) des übrigen Mantels (12.4).

7. Blende nach Anspruch 6, dadurch gekennzeichnet, dass der Mantel (12.4) mit einem Durchbruch (16) und/oder Bohrung versehen ist.